(19) RÉPUBLIQUE FRANÇAISE

INSTITUT NATIONAL
DE LA PROPRIÉTÉ INDUSTRIELLE

PARIS

(11) **N° de publication :** ***2 813 519***
(à n'utiliser que pour les commandes de reproduction)

(21) **N° d'enregistrement national :** **00 11399**

(51) Int Cl⁷ : **A 61 F 2/44,** A 61 L 27/18

(12) DEMANDE DE BREVET D'INVENTION — A1

(22) **Date de dépôt :** 07.09.00.

(30) **Priorité :**

(43) **Date de mise à la disposition du public de la demande :** 08.03.02 Bulletin 02/10.

(56) **Liste des documents cités dans le rapport de recherche préliminaire :** *Se reporter à la fin du présent fascicule*

(60) **Références à d'autres documents nationaux apparentés :**

(71) **Demandeur(s) :** *EUROSURGICAL Société anonyme* — FR.

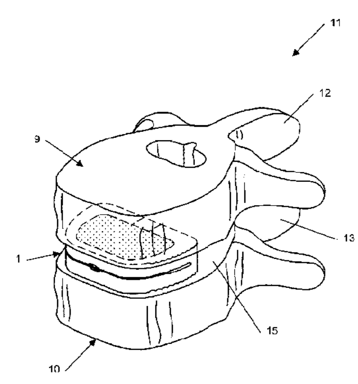
(72) **Inventeur(s) :** VIART GUY et ROKEGEM PASCAL.

(73) **Titulaire(s) :**

(74) **Mandataire(s) :** ROOSEVELT CONSULTANTS.

(54) IMPLANT INTERSOMATIQUE SOUPLE.

(57) L'implant intersomatique comprend une structure souple (2, 3, 4, 5) susceptible de se déformer élastiquement sous un effort de pression afin de mettre un greffon (7) sous une pression contrôlée pour favoriser son contact avec les corps vertébraux sus et sous jacents (9 et 10) d'une colonne vertébrale (11).



FR 2 813 519 - A1

FLEXIBLE INTERSOMATIC IMPLANT

The present invention relates to hollow intersomatic implants or cages designed for stabilization of the vertebral column, and more particularly for fusion of the lumbar vertebrae.

Each implant is designed to form a wedge that is inserted into a seat prepared between the mutually facing plates of two adjacent vertebrae, in such a way as to maintain a constant intervertebral disc space.

Hollow tubular intersomatic implants are known that comprise an internal cavity, and upper and lower openings providing communication between the internal cavity of the implant and the edges of the seat prepared between two adjacent vertebrae. The internal cavity of the implant is designed to receive a graft of spongy bone in order to permit intersomatic vertebral grafting.

Intersomatic implants are known that have, in cross section, an octagonal shape whose upper and lower faces are inclined along the longitudinal axis of the implant so that it has a conical profile and an internal part that is traversed vertically by a recess in which a graft of spongy bone is introduced.

Intersomatic implants are also known that have, for example, the form of a parallelepipedal cage into which a graft of spongy bone is introduced in order to permit intersomatic vertebral grafting.

It has been found that the above implants with tubular, octagonal or parallelepipedal profiles have a rigid structure that does not allow sufficient compression of the graft when the implants are arranged inside the seat or seats prepared between two adjacent vertebrae.

The reason is that the seat or seats comprise, in the cortical bone of each vertebra, mutually facing surfaces that have substantially the profile of the implant. Each surface constitutes a bearing zone for the rigid structure of the implant, reducing considerably the contact with the spongy bone.

It is this disadvantage in particular that the present invention is intended to remedy.

The intersomatic implant or cage according to the present invention has the aim of placing the graft under pressure in order to promote its fusion with the vertebral bodies lying immediately above and below it.

The intersomatic implant according to the present invention comprises a flexible structure capable of deforming elastically under a pressure force, so as to place the graft under a controlled pressure in order to promote its contact with the vertebral bodies lying immediately above and below it.

The intersomatic implant according to the invention comprises a substantially parallelepipedal flexible structure made up of two opposite branches of curved profile that are joined to each other by a third, straight branch in such a way as to delimit a central space able to receive the graft, said first and second branches being separated by a transverse slit having a defined width.

The intersomatic implant according to the invention has, in cross section, a wedge shape whose inclination varies depending on the pressure forces applied to the first and second branches in order to permit permanent contact of the graft with the vertebral bodies lying immediately above and below it.

The intersomatic implant according to the invention comprises, on the outer faces of the first, second and third branches, a serrated surface in order to improve its contact with the vertebral bodies lying above and below it.

The intersomatic implant is made of a stable and radiotransparent material.

The following description, in which reference is made to the attached drawings given as non-limiting examples, will provide a better understanding of the invention, of its characteristics and of the advantages that it affords. In the drawings:

Figure 1 is a perspective view illustrating the intersomatic implant according to the present invention.

Figure 2 is a plan view showing the intersomatic implant.

Figure 3 is a front view showing the profile of the slit that separates the first and second branches of the intersomatic implant.

Figure 4 is a perspective view illustrating the intersomatic implant according to the present invention arranged between two vertebral bodies of a vertebral column and subjected to a pressure force.

Figures 5 and 6 are views showing the intersomatic implant between two vertebral bodies, subjected to a pressure force.

In Figures 1 to 3, an intersomatic implant or cage 1 has been shown that comprises a substantially parallelepipedal flexible structure and is capable of deforming elastically under a pressure force.

The intersomatic implant 1 is made of a material composed of polyetheretherketone sold under the name PEEK. This material has the characteristics of being stable and radiotransparent.

The intersomatic implant 1 comprises two opposite branches 2 and 3 of curved profile that are joined to each other by a third branch 4 serving as a hinge.

The branches 2 and 3 are separated from one another by a transverse slit 5 whose ends are adjacent to the third branch 4.

The branches 2 and 3 are arranged one above the other and delimit, with the third branch 4, a central space 6 which extends vertically through the implant 1 and in which a graft 7 of spongy bone is introduced, as will be discussed in more detail below.

The branch 2 comprises a first segment 20 of curved profile integral with one of the ends of the third branch 4. The segment 20 is arranged perpendicular to the axis carrying the third branch 4.

The segment 20 is continued via a straight portion 21 which is parallel to the third branch 4. The straight portion 21 ends in a second segment 22 integral with the other end of the third branch 4.

The second segment 22 is arranged symmetrically with respect to the first segment, in relation to the axis passing through the centre, and perpendicular to the third branch 4.

In addition, the second segment 22 is arranged perpendicular to the axis carrying the third branch 4.

The second branch 3 is similar and is situated in a plane parallel to that containing the first branch 2.

The second branch 3 comprises a first segment 30 which has a profile identical to the segment 20 and integral with one of the ends of the third branch 4.

Similarly, the first segment 30 is continued via a straight portion 31 parallel to the straight portion 21 and to the third branch 4.

The straight portion 31 ends in a second segment 32 integral with the other end of the third branch 4. The second segment 32 is arranged symmetrically with respect to the first segment, in relation to the axis passing through the centre, and perpendicular to the third branch 4.

The slit 5 separating the two branches 2 and 3 communicates, between the segments 20, 30 and 22, 32, respectively, and in proximity to the third branch 4, with two seats 50, 51 of rectangular cross section.

The slit 5 comprises, on each straight portion 21 and 31 of the branches 2 and 3, an indent 52, 53 of semi-circle shape, allowing the application of an ancillary device (not shown) for introducing the implant 1 between two vertebrae of a vertebral column.

It will be noted that the slit 5 gives a certain flexibility to the branches 2 and 3, so that the latter, when subjected to a load, for example a pressure, can deform elastically and come into contact against one another in the area of the straight portions 21 and 31.

The outer surface of the third branch 4 and of the segments 20, 22 and 30, 32 of each branch 2 and 3 has a roughened appearance 8 in the form of parallel

serrations or waves, facilitating the fixation of the implant 1 between the vertebral bodies.

It will be noted that the implant 1 has, in cross section, a slightly conical profile in such a way that the height of the third branch 4 is always less than that of the two branches 2 and 3 when the latter are bearing against one another, as will be discussed in detail below.

In Figures 4 to 6, the intersomatic implant 1 has been shown between two vertebral bodies 9, 10 of a vertebral column 11 of a patient.

The intersomatic implant 1 is intended to replace the intervertebral disc provided between the vertebrae 9 and 10 of the vertebral column 11.

This type of implant is introduced between the vertebrae 9 and 10 by an anterior approach, that is to say from the side directed away from the spinous processes 12, 13 of each vertebra.

The intersomatic implant 1 is placed between the vertebrae 9 and 10 after complete ablation of the disc and preparation of the opposing plates 14, 15 for receiving the structure of the implant 1.

Each vertebra 9 and 10 is composed, in its central part, of spongy bone covered on its periphery with cortical bone. The cortical bone comprises, in proximity to the disc, cartilage fibres that provide it with a hard and strong structure.

The preparation of the plates 14 and 15 involves, on the one hand, exposing on each of the vertebrae 9 and 10 a large central surface area of spongy bone that will come into contact with the graft 7, and, on the other hand, exposing the edges of cortical bone to form

support zones for the branches 2, 3 and 4 of the implant 1 in the hard and strong part.

Before introduction of the implant 1 between the vertebrae 9 and 10, the central space 6 is filled with graft 7 composed of spongy bone originating either from the patient (autograft) or from another individual (allograft). Similarly, the graft 7 can be composed of separate materials, such as synthetic substitutes or the like, shaped before their introduction into the space 6 of the implant 1.

The intersomatic implant 1 filled with graft 7 is then introduced between the vertebral bodies 9 and 10 of the vertebral column 11 in such a way that the third branch 4 is directed towards the spinous processes 12 and 13.

It is found that, once the implant is arranged between the vertebrae 9 and 10, the branches 2 and 3 separated by the transverse slit 5 deform elastically under the pressure forces between the two vertebrae 9 and 10.

This elastic deformation under loading means the intersomatic implant 1 then has less height than that existing without loading, such that the graft 7 placed in the central space 6 is constrained between the plates 14 and 15 of each vertebra 9 and 10.

The graft 7 is thus compressed in its retaining space 6, thereby promoting its engagement with the vertebral bodies 9 and 10.

The constraint under which the graft 7 is placed is controllable, since it depends on the height of the transverse slit 5. This constraint must be sufficient, but without destroying the graft 7.

In addition, the height of the transverse slit 5 is designed such that the branches 2, 3 and 4 of the

implant 1 also support some of the pressure forces between the vertebrae 9 and 10.

The height of the slit 5 determines, on the one hand, the maximum elastic deformation of the branches 2 and 3, and, on the other hand, the total amount of controlled pressure that the graft 7 is subjected to, so as to facilitate subsequent fusion of the vertebrae 9 and 10 of the vertebral column 11.

CLAIMS

1. Intersomatic implant receiving, in its interior, a graft (7) intended for subsequent fusion of the vertebrae (9, 10) of a vertebral column (11), characterized in that it comprises a flexible structure (2, 3, 4, 5) capable of deforming elastically under a pressure force, so as to place the graft (7) under a controlled pressure in order to promote its contact with the vertebral bodies (9 and 10) lying immediately above and below it.

2. Intersomatic implant according to Claim 1, characterized in that it comprises a substantially parallelepipedal flexible structure made up of two opposite branches (2, 3) of curved profile that are joined to each other by a third, straight branch (4) in such a way as to delimit a central space (6) able to receive the graft (7), said first and second branches being separated by a transverse slit (5) having a defined width.

3. Intersomatic implant according to Claim 2, characterized in that it has, in cross section, a slightly conical profile whose inclination varies depending on the height of the transverse slit (5) and the pressure forces applied to the first and second branches (2, 3) in order to permit permanent and controlled contact of the graft (7) with the vertebral bodies (9 and 10) lying immediately above and below it.

4. Intersomatic implant according to Claim 3, characterized in that it has, in cross section, a slightly conical profile such that the height of the third branch (4) is always less than that of the two branches (2, 3) when the latter are bearing against one another.

5. Intersomatic implant according to Claim 2, characterized in that it comprises, on the outer faces of the first, second and third branches (2, 3, 4), a roughened surface (8) in the form of parallel serrations which improve its contact with the vertebrae (9, 10).

6. Intersomatic implant according to Claim 1, characterized in that the first branch (2) comprises a first segment (20) of curved profile integral with one of the ends of the third branch (4), said segment (20) being continued via a straight portion (21) which ends in a second segment (22) of curved profile integral with the other end of the third branch (4).

7. Intersomatic implant according to Claim 1, characterized in that the second branch (3) is similar to the branch (2) and comprises a first segment (30) of curved profile integral with one of the ends of the third branch (4), said segment (30) being continued via a straight portion (31) which ends in a second segment (32) of curved profile integral with the other end of the third branch (4).

8. Intersomatic implant according to Claim 2, characterized in that the slit (5) separating the two branches (2 and 3) communicates, in proximity to the third branch (4), with two seats (50, 51) of rectangular cross section.

9. Intersomatic implant according to Claim 2, characterized in that the slit (5) comprises, on each straight portion (21, 31) of the branches (2 and 3), an indent (52, 53) of semi-circle shape which allows an ancillary device to be applied for

introducing the implant (1) between the vertebrae (9, 10) of a vertebral column (11).

10. Intersomatic implant according to Claim 1, characterized in that it is made of a stable and radiotransparent material such as polyether-etherketone.

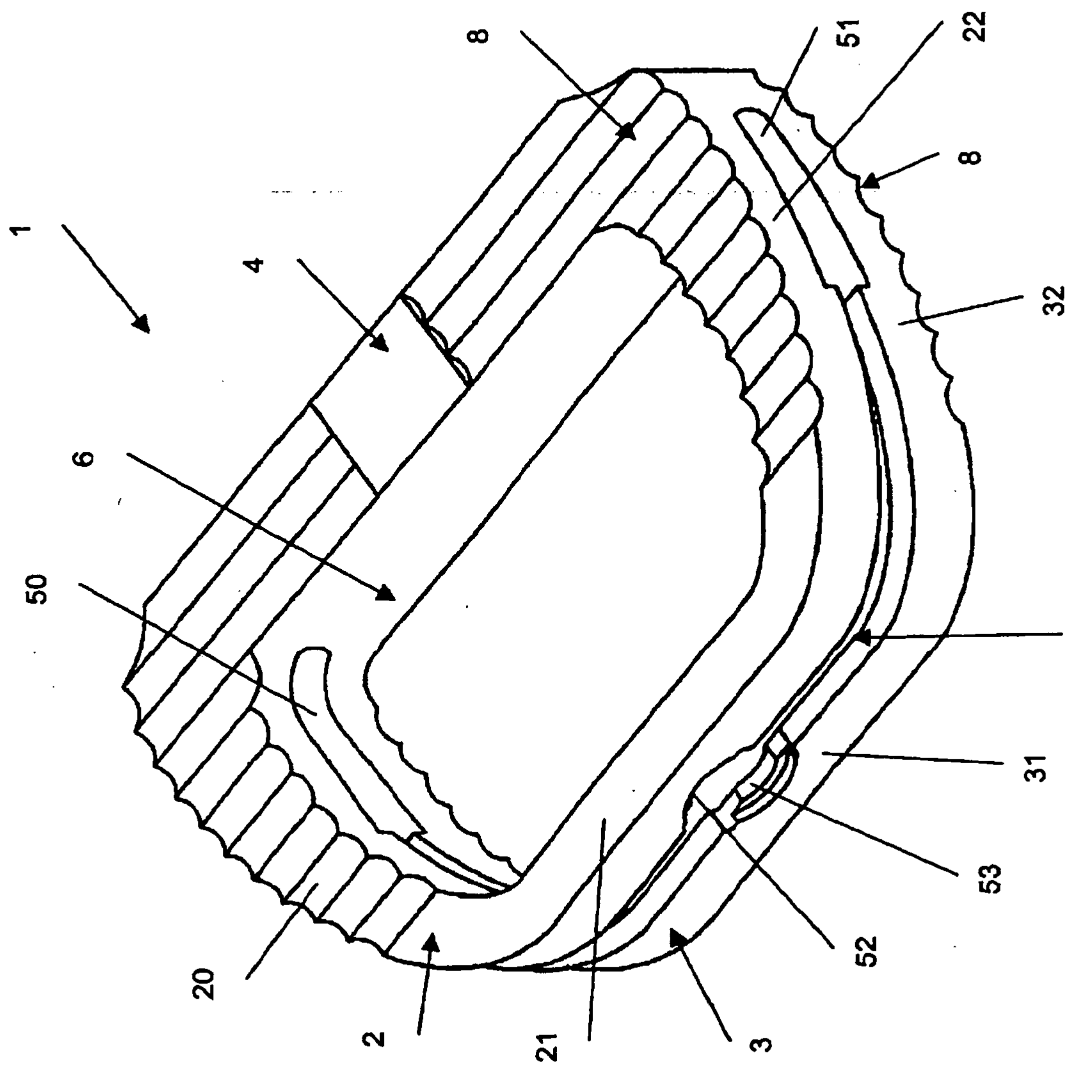


FIGURE 1

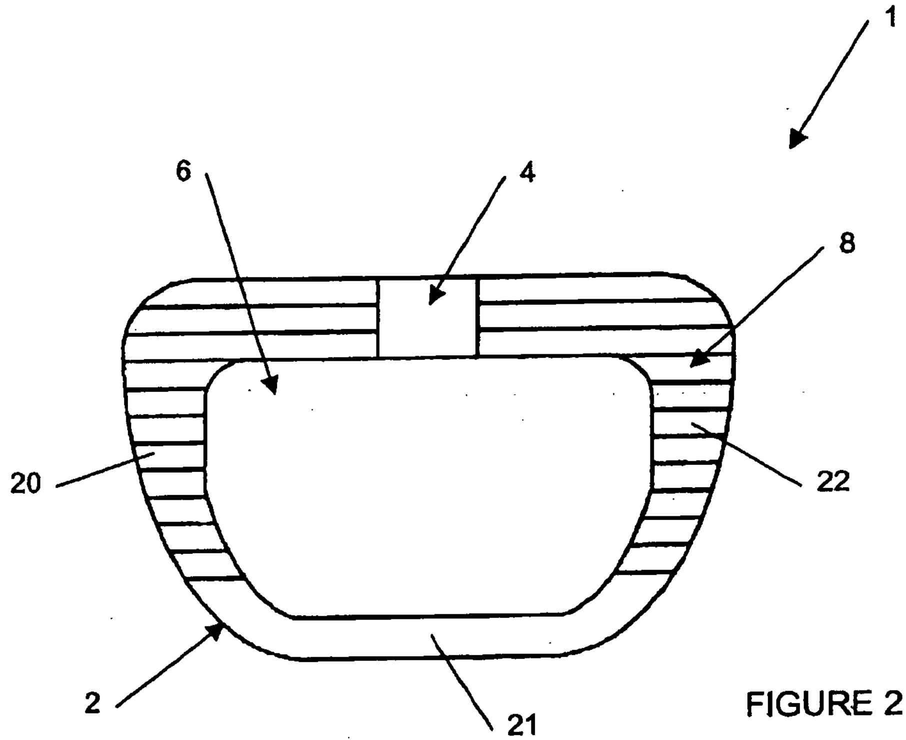


FIGURE 2

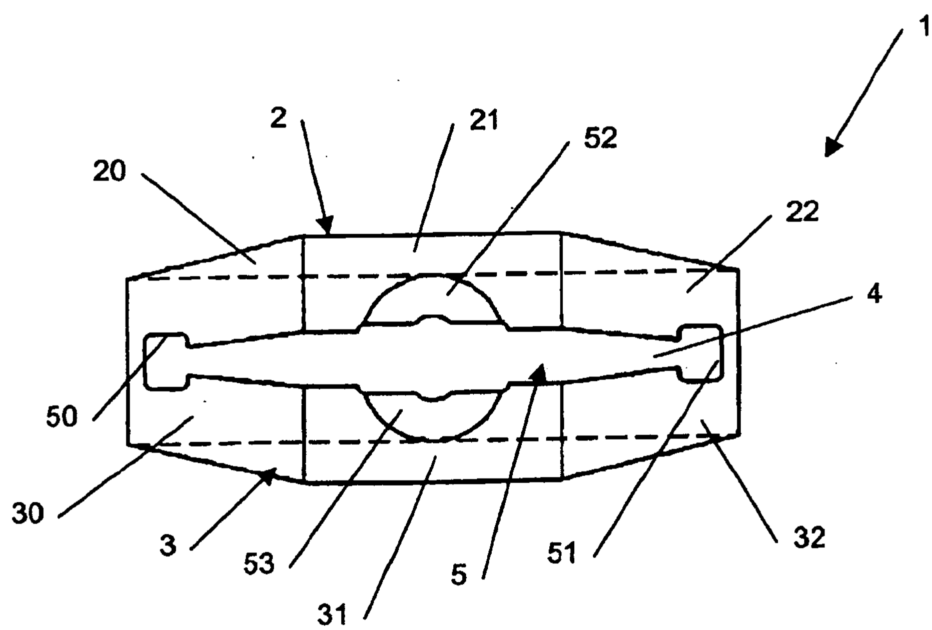


FIGURE 3

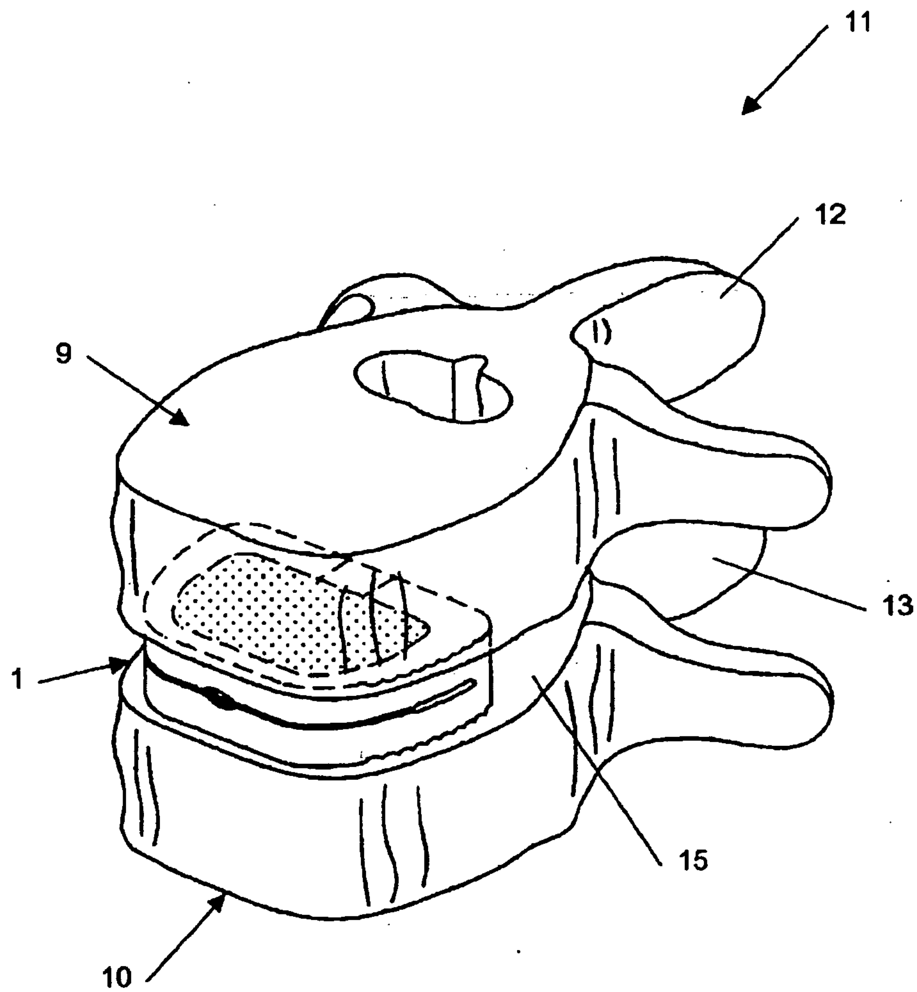


FIGURE 4

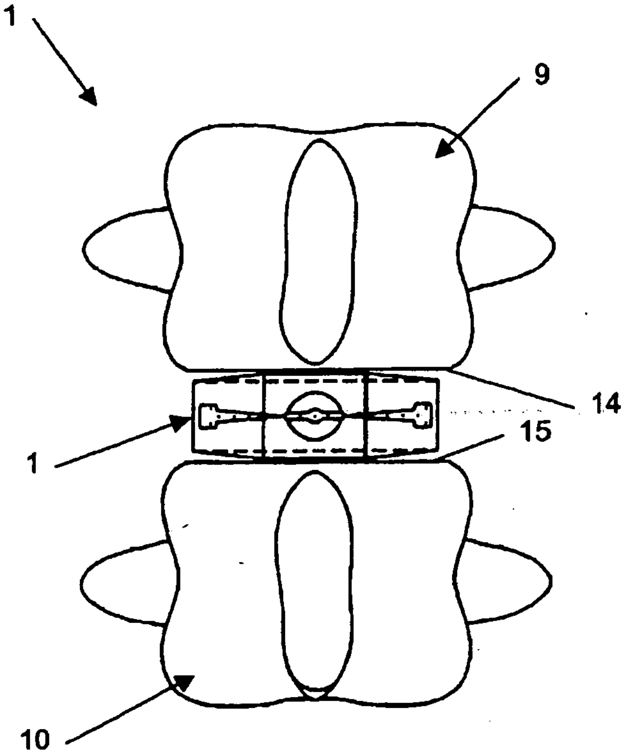


FIGURE 5

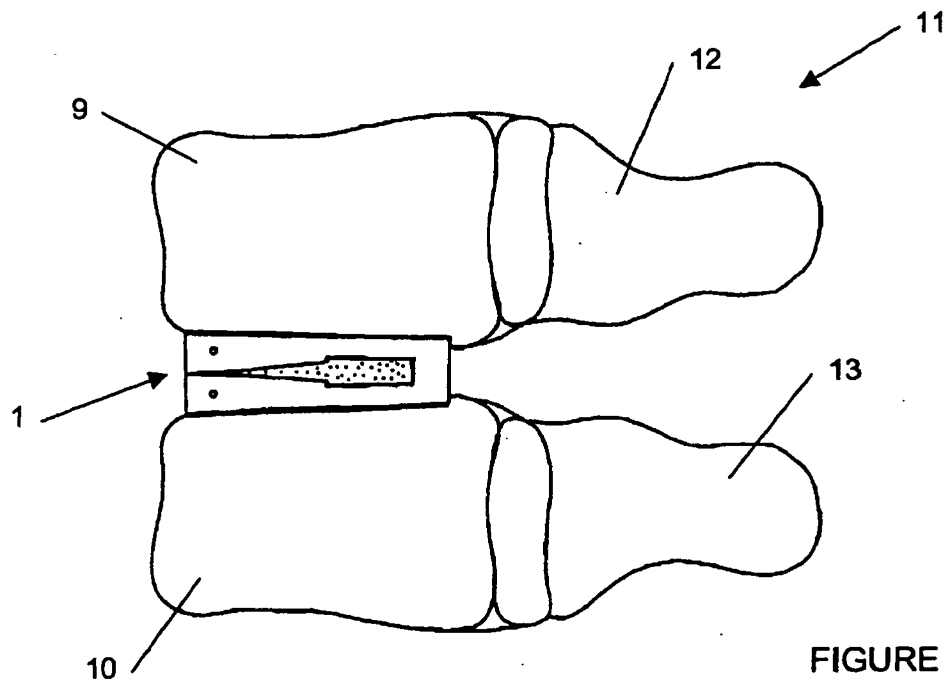


FIGURE 6